armstrong

INTEGRATED STEREO AMPLIFIERS MODELS 221 & 222

INSTALLATION & OPERATING INSTRUCTIONS, GUARANTEE CARD & SERVICE DATA.

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INSTALLATION AND OPERATING INSTRUCTIONS.

This amplifier has been designed as the basis for a complete sterephonic and monophonic reproducing system. As a consequence the instructions for connecting the various ancilliary units may seem to be a little more complicated than is usually the case. The instructions have been formulated on the assumption that the user's knowledge of electronics is negligible and we feel sure that if they are read and followed carefully, no difficulty will be experienced.

All the plugs required for connecting other equipment to the amplifier are supplied.

A certain amount of experimenting will probably be necessary to find the right position for the loudspeakers in your particular room. It is not possible to lay down hard and fast rules, because of the great variation in acoustic conditions between one place and another. As a general guide however, it will probably be best to place the speakers between 5 and 12 feet apart and in such a position that the usual listening area will be approximately this same distance from both speakers.

Two completely separate amplifiers are incorporated, one of which will be referred to throughtout as Channel A and the other as Channel B.

MAINS SUPPLY.

Each model is fitted with approximately 6 feet of lead for connection to the mains supply. Before connecting the amplifier the voltage selector plug on top of the mains transformer should be adjusted to the correct setting. It is suitable for AC. supply only, 40 - 60 cycles, adjustable between 200 and 250 volts. (Dual voltage models also cover 100 - 130 volts.)

Please note that the lead fitted for connection to the mains supply is a 3 - core lead and the colour coding is as follows: RED - LIVE; BLACK - NEUTRAL; GREEN - EARTH: Care should be taken to ensure that the correct connections are made.

H.T. FUSE. A 750mA fuse is incorporated and is located by the mains transformer. In the event of a failure, the fuse should be replaced by one of the same value and on no account should a higher rated fuse be used. In the event of persistent failure the amplifier should be checked to establish the cause. To replace the fuse, remove the polythene fuse holder and slide the fuse out of the holder. The fuse is of a standard-type and size and is easily obtainable.

LOUDSPEAKERS.

The loudspeaker output from each amplifier is located on the back of each of the output transformers. Looked at from the back, Channel A output transformer is on the right and the Channel B output transformer on the left. One loudspeaker (or speaker system) should be connected via a 2 pin plug (one large pin and one small pin) to one of the transformers and the second loudspeaker to the other. Each transformer has three alternative positions covering impedance of 4, 8 and 16 ohms and the loudspeaker should be connected to whichever of these is nearest to its quoted impedance (eg a 15ohms speaker is connected to the 16 ohms position)

When connecting to the 4 ohms output, the plug is inserted into the two left hand sockets and whn connecting to the 16 ohms output the plug is inserted into the two right hand sockets. When connecting to the 8 ohms output, the smaller pin is inserted into the centre socket and the larger into either of the sockets on each side of it.

Where the loudspeaker terminals are designate as positive and negative, the negative twrminal should be connected to the larger pin of the two pin plug. Where there is no such designation and identical speakers are used the left hand terminal should be connected to the larger pin of the two pin plug.

This procedure will ensure that the two loudspeakers are 'in phase ' but where dissimilar loudspeakers are used for each channel connect the loudspeakers and try the results from a stereo input then reverse the connections of one of the speakers only. Results may be noticeably better in one case that in another.

If only one loudspekaer (or speaker system) is to be used initially this should be connected to the Amplifier A output transformer. A dummy load in the form of a 15 ohms, 10 Watt resistor should then be connected across the 15 ohms output of the amplifier B transformer.

CENTRE CHANNEL LOUDSPEAKER. An alternative to 2-speaker stereo is 3-speaker stereo. A third speaker will fill the 'hole-in-the-middle' effect which sometimes occurs, particularly where the left and right speakers are rather wide apart. The third speaker overcomes this and can create a marked spreading of stereo effect whilst widening the area of best listening and will normally enable the left and right speakers to be moved further apart.

Connect the two leads from the third speaker, one to each output transformer, according to the impedance of the speaker Each lead should be connected to the 'live' side of the output i.e. small pin.

The result is that the difference between the left and right channels is supplied to the third speaker, there will be no output from the centre speaker.

INPUT DATA.

INPUT	CODE	MODEL 221		MODEL 222	
		Sensitivity	Impedance	Sensitivity	Impedance
TAPE MONITOR	TM	600mV	100K	Not applicable.	
TAPE PLAYBACK	TP	80mV	2M	80mV	2M
RADIO	R	80mV	2M	80mV	2M
PICKUP 1	P1	80mV	2M	80mV	2M
PICKUP 2	P2	3.5mV	50K	Not applicable	

In all cases, connections should be made to both A and B inputs for stereo sound sources and to A inputs only for mono sound sources. Screened leads must be used to connect all inputs, ordinary screened lead will be quite satisfactory although co-axial lead is to be preferred where the connecting leads is of undue length.

INPUT SWITCHING.

The input sockets are switched types and are automatically switched to their correct function when the co-axial plug is pushed into the socket. Accordingly a mono sound source, when plugged into an A input as instructed above, will automatically be fed to both amplifiers and consequently both speakers. The only additional requirements are as follows. On Model 221 only, in the case on Pickup 1 input, if a mono pickup is used as well as connecting this to the A input, a plug with no connections to it whatsoever, must be plugged into the B input. Also on Model 221 only, a mono tape recorder must be connected to both A and B Tape Playback inputs to achieve an output from both amplifiers.

The Selector switch on the fron of the amplifier selects either Radio, Tape Playback or Pickup with two positions, mono and stereo, for pickups. The stereo position is for normal stereo gramophone reproduction, the mono position is for mono records, whether played from either a mono or stereo pick-up.

Mono or Stereo (when available) is selected at the radio tuner and mono or stereo tape playback is selected at the tape recorder. In all these cases with the two exceptions noted above, where only the A input is connected this is automatically switched to both channels at the input socket.

PICK-UP INPUT P1.

This input is designed for any ceramic or crystal pick-up. Although the sensitivity is 80mV the overload factor is so high that the highest output pickups will not cause distortion due to over loading of the input.

PICK-UP INPUT P2 (MODEL 221 ONLY)

This input is designed for low - output magnetic pickups. Please note that the two pickup inputs (1 and 2) are alternatives and it is not possible to connect one pickup to one input and another pickup to the other input, unless a switch is incorporated in the pickup wiring external to the tuner-amplifier. Where more than one cartridge is being used this would normally be arranged using and arm with alternative plug-in heads although where the tape playback input is not in use for its primary purpose, this can be used as an additional pickup input.

TAPE PLAYBACK INPUT.

This input is intended for playback either from a complete tape recorder or from a tape deck with its associated tape pre-amplifier and will be suitable for the output available from all tape recorders. As in the case of the pickup input P1 the overload factor of the input is sufficient to accomodate the output from all tape recorders.

TAPE MONITOR INPUT (MODEL 221 ONLY)

This input for both mono and stereo, is provided for use with tape recording equipment which enables the signal being recorded to be monitored from the tape whilst the recording is being made. This direct-from-tape monitoring should not be confused with the normal facility incorporated in all models which alows the signal being recorded to be heard in the normal way.

Whilst recording, the signal being recorded would normally be heard at the loudspeakers (depending on the position of the volume control.) but when the tape monitor button is pushed in, this signal is removed from the amplifier and is replaced by the signal from the output of the tape recorder which reproduces the sig. from the tape after it has been recorded. This enables the listener to make an instant comparison between the signal going on to the tape and the signal coming off the tape

Although this input is switched by the tape monitor push button on the front of the amplifier it can be used as a normal tape playback input for recorders, which do not deliver a signal whilst recording. In these circumstances the switch can be ignored. This input should only be used in this way when your tape recorder has a relatively high playback output voltage of 500 mV. or more. Otherwise use the normal tape playback input.

RADIO INPUT. This is suitable for any radio tuner including, of course, the matching Armstrong Tuners. The mono output from a radio tuner should be fed into the A input.

Armstrong tuners have been designed so that a unit providing for the reception of Multiplex stereo broadcasts can merely be plugged into them at any time in the future. At the present time, stereo broadcasts using the G.E. Zenith system, are available in the United States but in the United Kingdom the BBC who are also using this system, are still only broadcasting on an occasional experimental basis. Experimental transmissions are also taking place in some other countries.

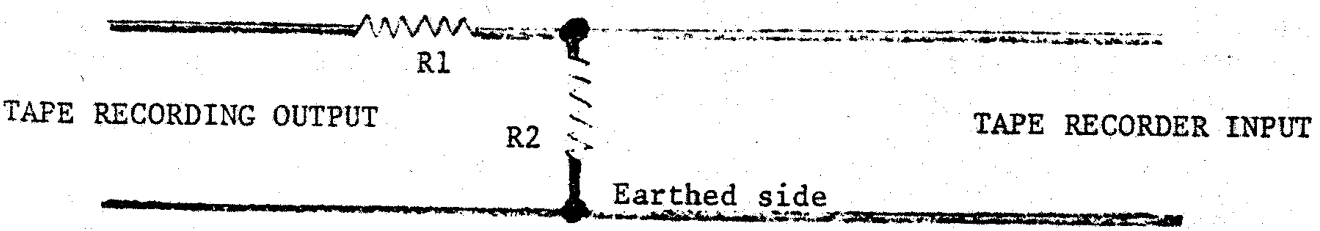
As soon as regular stereo transmissions begin in the U.K an Armstrong Stereo Multiplex Decoder will be available on the same basis as other countries. The two outputs from an Armstrong Tuner, each with a pre-set output control, would then be connected to the A and B inputs of the amplifier.

TAPE RECORDING OUTPUT. This output enables both stereo and mono recordings to be made from any sound source being reproduced by the amplifier. The output is permanently available and the signal reproduced at the output is selected at the selector switch. The output is after the tone controls so that the signal being recorded can be adjusted by these controls. The output is before the volume control and is, therefore, independent of this control. This means that the signal being recorded can be heard through the loudspeakers at any volume, or with the volume control at minimum, without the level of the recording bein g affected.

For use with a mono tape recorder (or tape pre-amplifier) connect to output A and with a stereo tape recorder to outputs A and B.

The average output available is 500mV and although this will be suitable for most tape recorders, it may be too high in some cases (for example with certain European models). The effect in these cases is to make the recording level control of the tape recorder inflexible and difficult to use because as soon as it is advanced by a very small amount the full recording level would be reached.

In these cases the output signal can be reduced by means of a simple attenuator as follows:



eg	Output of 100mV required	R1 = 82 K	R2 = 22K
	Output of 10mV required	R1 = 100K	R2 = 2.2K
	Output of 1mV required	R1 = 100K	R2 = 220 ohms.

Where both A and B outputs are feeding a stereo tape recorder the attenuating circuit, if it is required, will need to be connected in each channel.

CONTROLS

SELECTOR SWITCH A 5 position switch for selecting Pickup Mono, Pickup Stereo, Tape and Radio. The mains On/Off switch is also incorporated.

VOLUME CONTROL A tandem potentiometer with both channels ganged on the one control.

BALANCE CONTROL A tandem potentiometer which varies the output from each channel in relation to the other. It enables the output to each loudspeaker to be varied in order to get correct balance between the two channels.

TREBLE AND BASS TONE CONTROLS Separate tandem potentiometers with the separate tone controls on each channel ganged. Each control is continuously variable.

RUMBLE FILTER (L.F.) This is controlled by a pre-set switch on the back of the chassis and should be switched in if the gramophone turntable being used is causing rumble. The filter gives a 6dB fall off at 35cps with an increasing slope at lower frequencies.

TREBLE FILTER (MODEL 221 ONLY) This is controlled by the push-button switch labelled "FILTER" which should be pressed in to bring the filter into operation. The turnover frequency is 8 Kc/s with a 12dB per octave roll-off above this frequency. The filter will be found useful in reducing noise on certain records and high frequency distortion from all sound sources where this is present. The effect of the filter will be scarcely apparent on AM since this circuit incorporates a built-in heterodyne rejection filter.

LOUDNESS (MODEL 221 ONLY) This is controlled by the push-button switch labelled "LOUDNESS" which should be pressed in to bring the circuit into operation. When switched in, this superimposes "loudness" contours on the otherwise flat response volume control circuit. In effect, this means that additional treble and bass are automatically inserted at low sound levels, compensati for the reduced ability of the human ear to hear the extreme ends of the audible frequency range at low volume. When switched out, the volume control acts convention and if the loudness compensation is not found to be desirable, even at low volume leve this facility should not, of course, be used.

FITTING INSTRUCTIONS.

The amplifier is designed so that it may be fitted either in its own optional shelf-mounted case or into a cabinet with other equipment. The instructions for fitting into the case are supplied with the case but for fitting into a cabinet proceed as fol

Cut the facia panel in your cabinet in accordance with the template provided at the back of this manual. Cut as accurately as possible and you will find that the amplifier front panel will cover the rough edges of the cut-out.

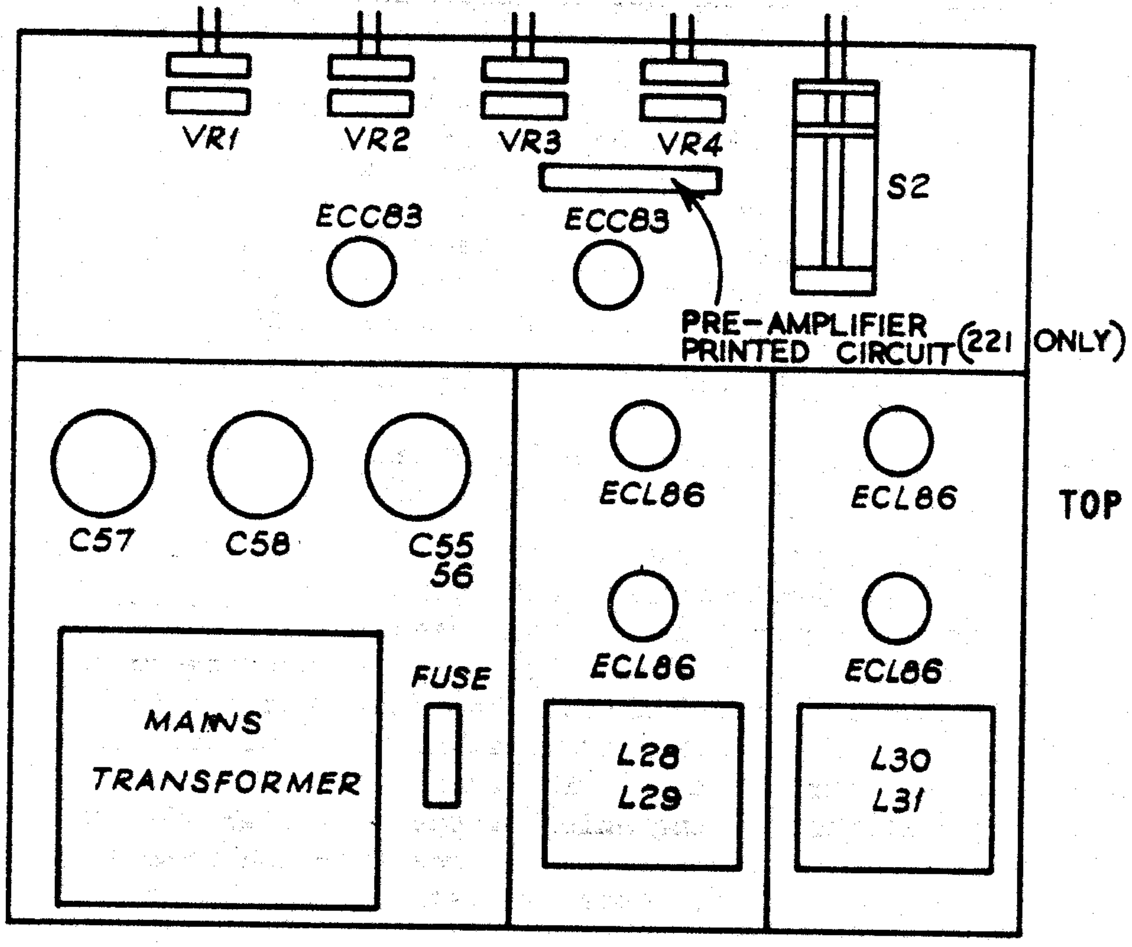
Fit the front panel to the amplifier by placing it in position and use the threaded panel bushes to secure the panel. The female bushes are located at the spindle of the volume control and treble control and the male bushes will be found with the other sundry items supplied. Using the two-pronged screwdriver supplied, tighten the male bushes until the panel is secure. Ensure that you do not overtighten. The control knobs provided can then be fitted.

The amplifier should be provided with a baseboard or rails to support its weight, the top of which should be level with the bottom of the panel cut-out. With this support in position, slide the instrument through the cut-out from the front until the front panel is flush with the cabinet.

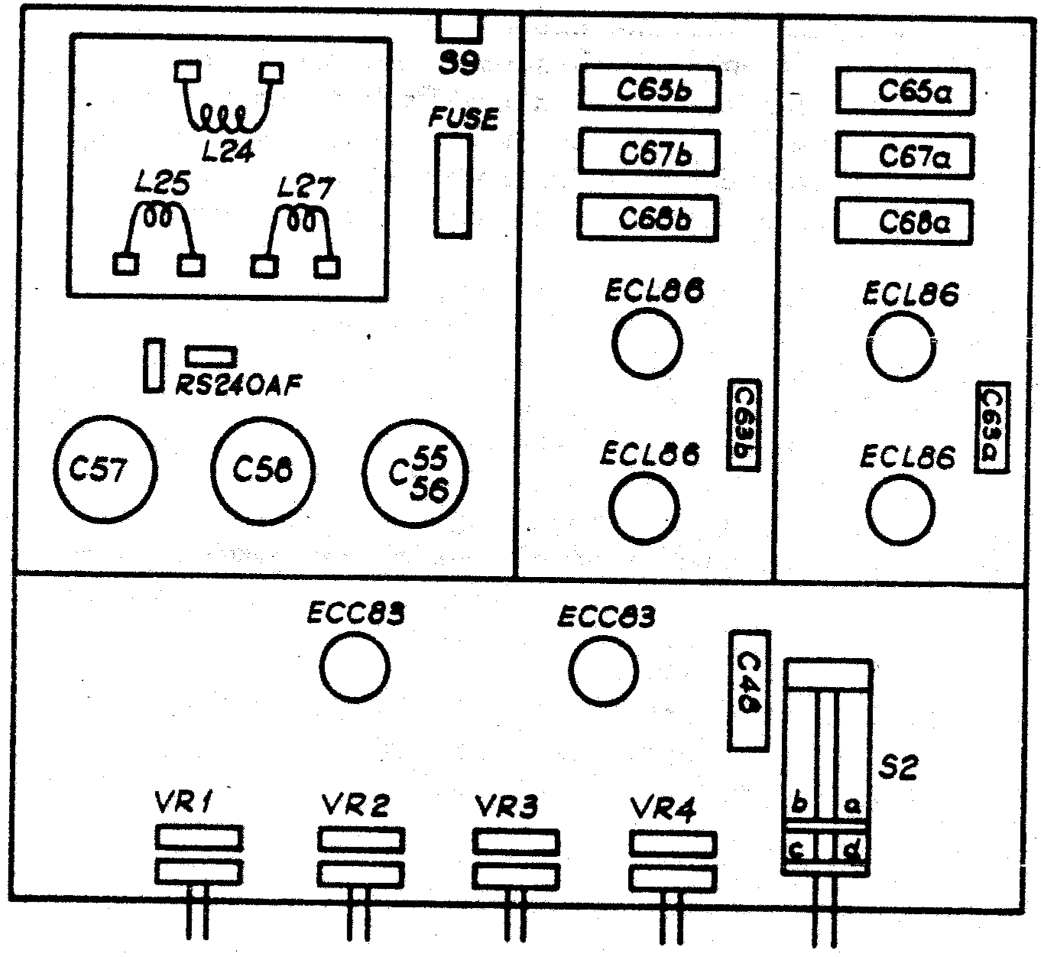
A pencil line should then be drawn round the two sides and the back of the chassis and the amplifier should then be withdrawn from the cabinet. Take the mounting template provided at the back of this manual and line it up to the pencil line (it may be slightly over or within the line, depending on how finely this has been drawn in relation to the chassis). Mark the four fixing holes shown on the template, drill four ¼" holes, and then slide the amplifier back into position It is then fixed by the four 1" PK screws provided, screwing these up from under the supporting board into the fixing holes of the amplifier. The four captive nuts to receive the PK screws are already fixed in position and need not be touched unless they have been inadvertently moved whilst sliding the amplifier in and out

Ventilation The amplifier should always be mounted so that reasonable ventilation is available for the heat dissipated by the valves and power pack. If the cabinet has an open back this should not present any problem but if not, several large holes should be made in the back to enable a through drought to circulate. If the chassis is supported in the cabinet by a solid shelf rather than rails, a number of holes should be drilled in the shelf to provide ventilation, Never place the installation near radiators or in front of heating vents.

CHASSIS LAYOUT

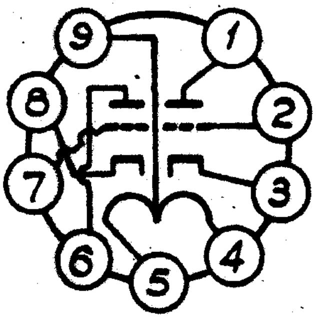


TOP VIEW

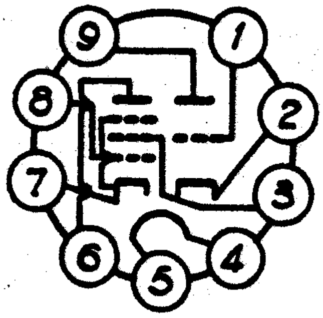


UNDERSIDE VIEW

VALVE BASE DIAGRAMS — DRAWN AS SEEN FROM UNDERSIDE OF BASE



ECC83



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COMPONENTS INCLUDED IN MODEL 221 BUT NOT 222

RESISTORS - values in Ohms.

R.No.	VALUE	TYPE
81a-b	4.7K	10%
82a-b	150K	10%
83a-b	330K	10%
84a-b	75K	5%
85a-b	15K	10%
86a-b	100K	10%
87a-b	470K	10%
88a-b	10K	10%
89a-b	27K	10%
90a-b	680	5%
91a-b	18K	10%
92a-b	68K	10%
93a-b	3.9K	10%
94a-b	8.2K	10%
95a-b	15K	10%
96	3.9K	10%
97	33K	10%
98a-b	6.8K	10%
99a-b	6.8K	10%
100a-b	220	10%
101	27K	10%

CAPACITORS

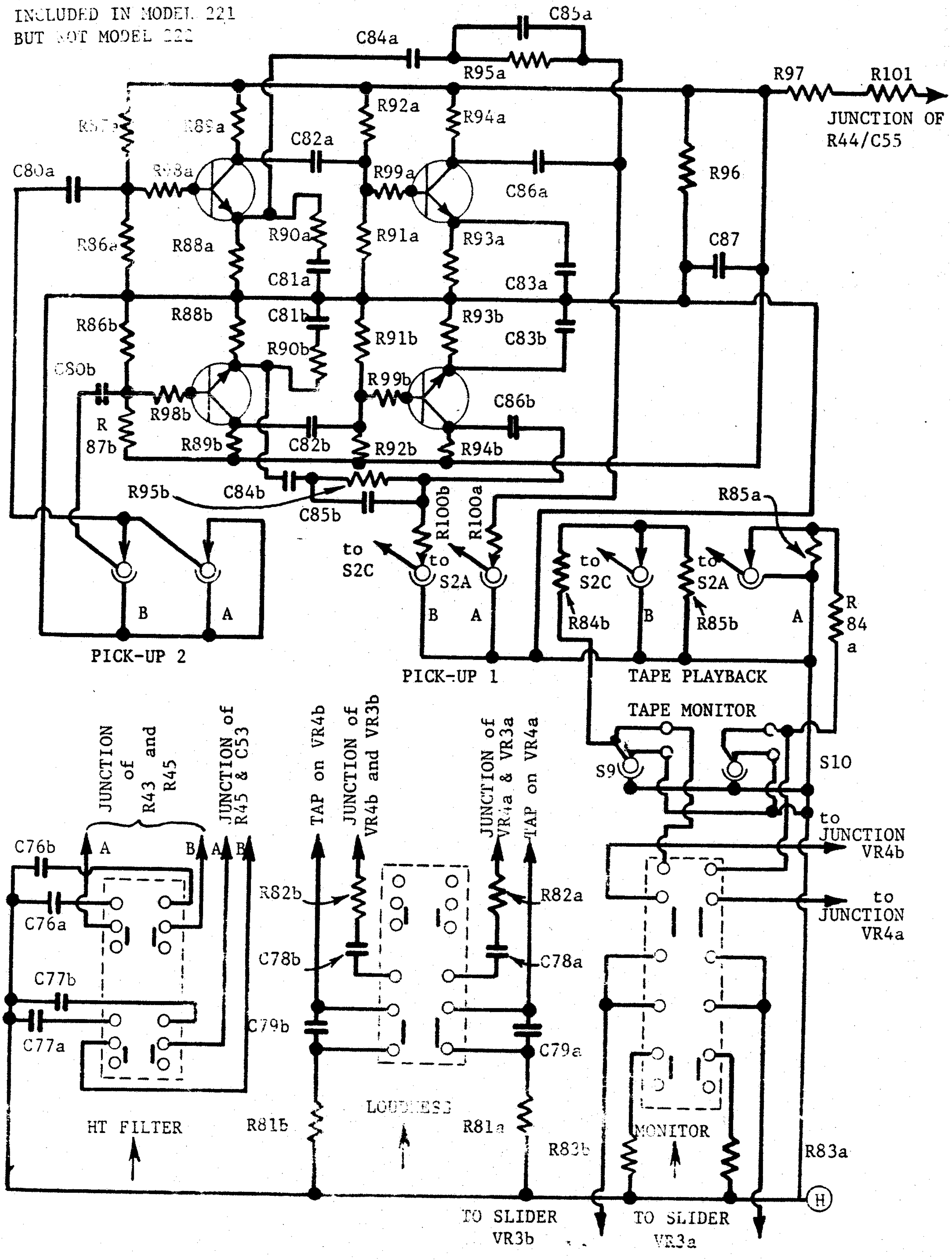
C.No.	VALUE	TYPE
76a-b	580pF	5%
77a-b	1000pF	5%
78a-b	100pF	10%
79a-b	0.1uF	-
80a-b	25uF	ELECT
81a-b	8uF	ELECT
82a-b	25uF	ELECT
83a-b	25uF	ELECT
84a-b	0.022uF	-
85a-b	6800pF	5%
86a-b	0.033uF	-
87	500uF	ELECT

TRANSISTORS

No.	TYPE
TR1a-b	BC 109
TR2a-b	BC 109

Note: Pickup 1 and Tape Playback inputs are shown on circuit opposite because although these inputs are included in Model 222 they are wired differently in each amplifier.

CIRCUIT DIAGRAM OF COMPONENTS
INCLUDED IN MODEL 221
BUT NOT MODEL 222



CAPACITORS					
C Nº	VALUE	TYPE	61a-b	0·01µF	–
48	16µF	ELECT.	62a-b	0·1µF	–
49a-b	4700pF	–	63a-b	100µF	ELECT.
50a-b	0·02µF	–	64a-b	450pF	–
51a-b	360pF	–	65a-b	16µF	ELECT.
52a-b	3300pF	–	66a-b	0·1µF	–
53a-b	0·1µF	–	67a-b	1000µF	ELECT.
54a-b	25µF	–	68a-b	1000µF	"
55	100µF	ELECT.	69a-b	0·1µF	–
56	100µF	"	70a-b	47pF	10%
57	100µF	"	91a-b	1500pF	–
58	100µF	"			
59	0·005µF	–			
60	0·005µF	–			

RESISTORS VALUES IN OHMS					
R Nº	VALUE	TYPE	57a-b	3·9K	10%
37a-b	2·2M	5%	58a-b	220K	10%
38a-b	2·2K	5%	59a-b	8·2K	10%
39a-b	68K	5%	60a-b	47K	10%
40a-b	470K	5%	61a-b	220K	10%
41a-b	6·8K	5%	62a-b	3·9K	10%
42a-b	39K	5%	63a-b	1M	5%
43a-b	100K	5%	64a-b	1M	10%
44	22K	10%	65a-b	1M	5%
45a-b	1M	5%	66a-b	1M	10%
46a-b	100K	10%	67a-b	4·7K	10%
47a-b	2·7K	20%	68a-b	300	5%
48a-b	47K	10%	69a-b	300	5%
49a-b	47K	10%	70a-b	2·7K	5%
50	470	20%	71a-b	100	5%
51	100	10%	72a-b	4·7K	10%
52	47	20%			
53	47	20%			
54	27	10%			
55a-b	330K	10%			
56a-b	1M	10%			

POTENTIOMETERS	
VR1a-b	250K LIN ~ BASS
VR2a-b	250K LIN ~ TREBLE
VR3a-b	100K LOG + 100K ANTI-LOG ~ BALANCE
VR4a-b	100K SEMI-LOG ~ VOLUME

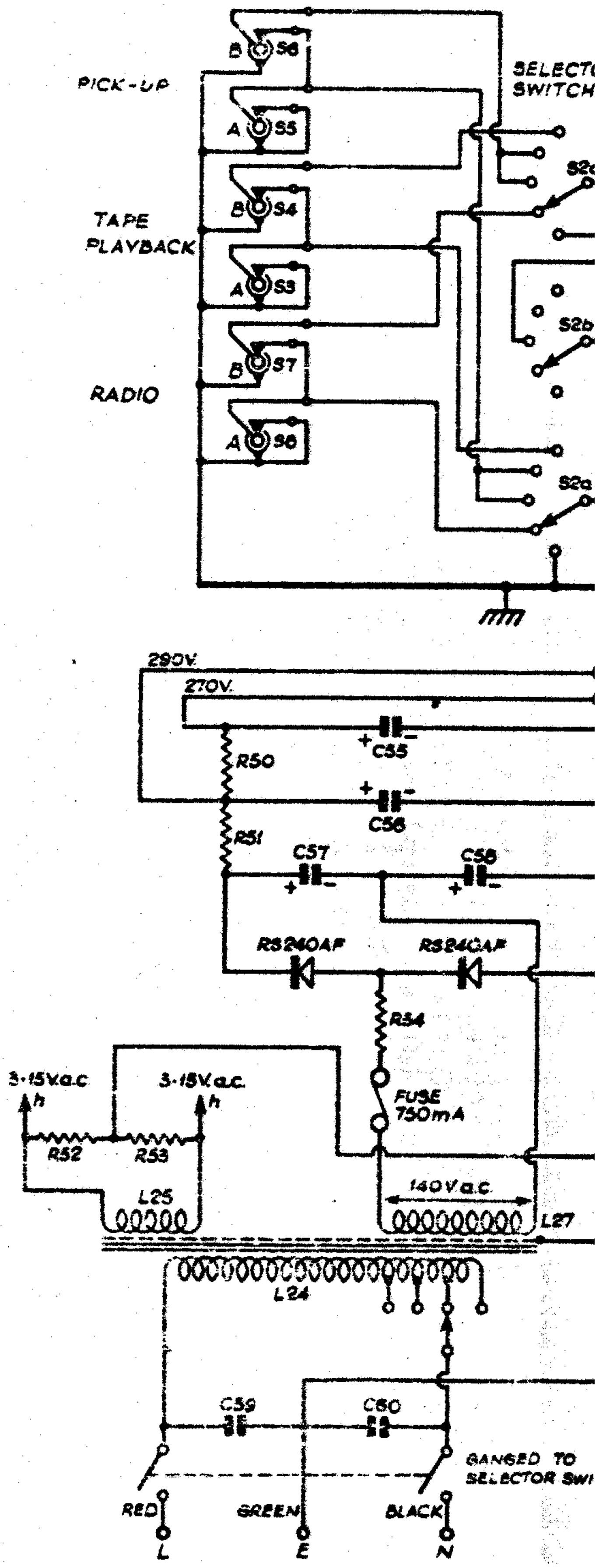
TRANSFORMERS		
L Nº	TYPE NUMBERING OR DESCRIPTION FOR ORDERING	RESISTANCE (OHMS)
24	MAINS TRANSFORMER ~ STATE MODEL AND PRIMARY VOLTAGE RANGE	–
25		–
27		–
28	9999 OUTPUT TRANSFORMER	350
29		0·8 (16Ω TAP)
30	9999 OUTPUT TRANSFORMER	350
31		0·8 (16Ω TAP)

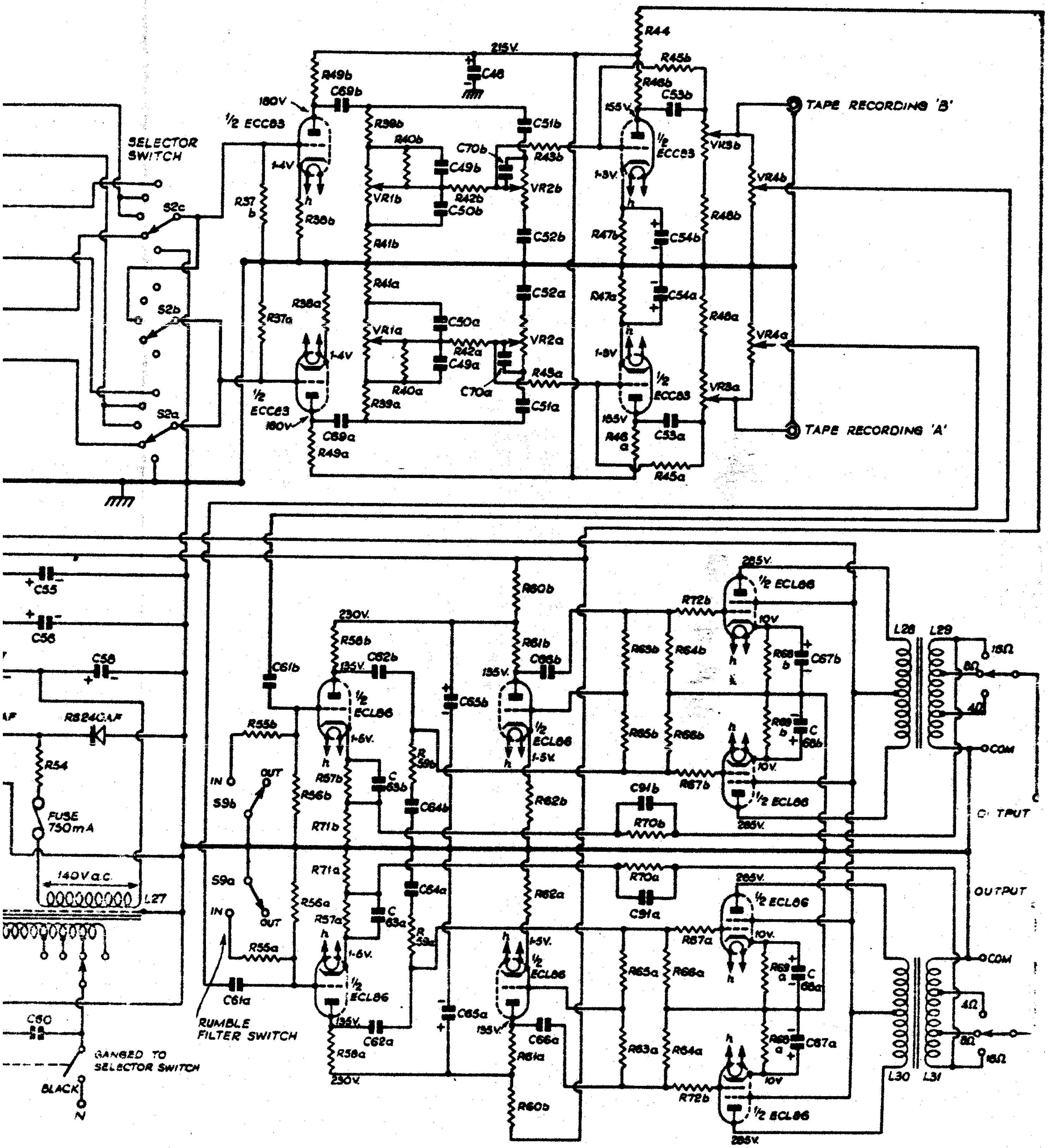
ALTHOUGH THE NUMBERING OF COMPONENTS MAY APPEAR ILLOGICAL THIS IS BECAUSE THE SAME NUMBERS ARE USED IN OTHER MODELS HAVING IDENTICAL CIRCUITRY.

CIRCUIT DIAGRAM & COMPONENTS TABLE

MODELS 221 & 222

Separate sheet for circuit diagram of components included in 221 but not 222





SELECTOR SWITCH
S2c
S2b
S2a
215V.
C48
R44
R45b
R46b
C53b
TAPE RECORDING 'B'
R49b
C69b
180V
1/2 ECC83
R39b
C51b
R40b
C70b
R43b
155V.
1/2 ECC83
VR3b
VR4b
1·4V
C49b
R42b
VR2b
1·5V.
R37 b
R38b
VR1b
C50b
h
R41b
C52b
R47b
C54b
R48b
R41a
C52a
R47a
C54a
R48a
R38a
R37a
VR1a
C50a
VR2a
VR4a
1·4V
R42a
C49a
1·5V
C70a
R43a
R40a
1/2 ECC83
1/2 ECC83
VR3a
R39a
C51a
180V
155V
C69a
C53a
TAPE RECORDING 'A'
R49a
R46 a
R45a
C55
C56
C58
RS24GAF
R54
FUSE 750mA
140V a.c.
L27
C60
GANGED TO SELECTOR SWITCH
BLACK
N
C61b
230V.
R58b
C62b
135V.
1/2 ECL86
R60b
R61b
C66b
135V.
1/2 ECL86
C65b
R55b
IN
OUT
S9b
R56b
R57b
C 63b
R 59b
1·5V.
1·5V.
R62b
C64b
R71b
R71a
S9a
IN
OUT
R56a
R57a
C 63a
C64a
R 59a
R62a
R55a
C61a
1/2 ECL86
1·5V.
1/2 ECL86
RUMBLE FILTER SWITCH
C62a
135V.
R58a
230V.
C65a
135V.
C66a
R61a
R60b
285V.
1/2 ECL86
R72b
10V
R63b
R64b
R68 b
C67b
R65b
R66b
R69 b
C 68b
R67b
10V
1/2 ECL86
285V.
C91b
R70b
R70a
C91a
285V.
1/2 ECL86
R67a
10V.
R65a
R66a
R69 a
C 68a
R63a
R64a
R68 a
C67a
R72b
10V
1/2 ECL86
285V.
L28
L29
16Ω
8Ω
4Ω
COM
OUTPUT
OUTPUT
COM
4Ω
8Ω
16Ω
L30
L31